Energy Supply Technical Work Group
Summary List of Recommended High Priority Mitigation Options

The eight policy options described below correspond to the options identified as high priority for further elaboration by the TWG during its call of June 18, 2007. TWG members volunteered to write descriptions for the eight options; the text in this document is the product of the groups' deliberations.

The descriptions appear in this document as the CCS received team them. Edits to content are indicated in the text with "*[CCS note:…]*".

Once the TWG has had an opportunity to discuss the options descriptions, CCS will submit a revised options descriptions document to the CAT. The CAT will decide which of the options warrant further or closer examination.

#	Mitigation Option Name	List of Volunteers
ES-1 (old 2.2)	Grid-based renewable energy incentives and/or barrier removal	Roger Garratt, Brian Skeahan, John Ryan, Nancy Hirsh,
ES-2 (old 2.3)	Distributed renewable energy incentives and/or barrier removal	Bill LaBorde, Roger Garratt, John Ryan
ES-3 (old 2.9, 3.3)	Efficiency improvements at existing renewable and power plants	Gregg Carrington, Steve Silkworth, Kyle Davis, Rod Brown, Steve LaFond
ES-4 (old 1.6, 2.8, 3.4)	Technology Research & Development, plus Technology-Focused Initiatives	Tony Ifie, Nancy Hirsh, Bill LaBorde, Doug Jackson
ES-5 (old 5.1, 5.2, 3.1b)	CCSR (including post-combustion) incentives, requirements and/or enabling policies plus R&D	Doug Jackson, Kyle Davis, Roger Garratt, Bob Guenther, Steve Silkworth
ES-6 (old 6.1, 6.2, 6.5)	Transmission system capacity, access, efficiency, and Smart Grid	Stacey Waterman-Hoey, Nancy Hirsh, Gregg Carrington
ES-7 (old 2.5)	Combined Heat and Power (CHP) and Thermal Energy Recovery and Use	John Ryan, Stan Gent, Steve Silkworth, Rod Brown
ES-8 (old 3.1a)	Advanced fossil fuel generation and pre-combustion sequestration technologies	Kyle Davis, Roger Garratt, Bob Guenther

Options still under consideration as possible high priority (not decided during June 18 TWG call) are listed in the following table.

Catalog #	Mitigation Option Name	Notes
2.4	Green power purchases and marketing	
2.10	Use carbon offsets markets to promote additional renewable energy development	Include in other discussions on market based mechanisms (cap and trade, carbon tax)?
4.5b	Coal-to-gas production	
4.7	LNG policies and infrastructure	

Options with other follow-up are listed below.

Catalog #	Mitigation Option Name	
1.7	Climate change education initiatives	TWG suggests that the TWG should develop over-arching education policy
2.7	Renewable energy development issues	Keep at moderate priority, limited ability for state actions

ES-1. Grid-based Renewable Energy Incentives and/or Barrier Removal

Based on ES Catalog Option 2.2

Mitigation Option Description

This policy option addresses the barriers to and possible incentives for expanding grid-based, or utility-scale, renewable resources, and reflects the use of financial incentives and other efforts, such as improving the ability to integrate intermittent wind resources, to encourage investment in renewable energy sources by businesses that sell power commercially.

Mitigation Option Design

- Financial incentives for grid-based renewables could include, among others: (1) direct subsidies for purchasing/selling renewable technologies given to the buyer/seller (e.g. via a public benefit fund); (2) feed-in tariffs, which provide direct payments to renewable generators for each kWh of electricity generated from a qualifying renewable facility; (3) tax credits for each kWh generated from a qualifying renewable facility; and (4) regulatory policies that provide incentives and/or assurance of cost recovery for utilities that invest in renewable energy systems.
- Availability of Resources: If all WA and OR RPS are met with wind, that's about 10,500 MW of wind by 2025, without consideration [*potential CCS edits for clarity: of Northwest renewable electricity resources that might be exported to meet green power needs in*] California or other states. It may be reasonable to reconsider what's defined as "renewable" under the RPS, such as organic pulping byproducts. Alternatively, another set of policies could be developed to target a different category of resources, that do not meet the eligibility requirements under the RPS but might be considered "low GHG emission" resources, like hydro, wind from just across the border in Canada, etc..
- Regulatory Uncertainty: Uncertainty in recovering prudently incurred costs is a barrier for IOUs in the following areas:
    - Development Costs: While the RPS states utilities are "entitled to recover" all prudently incurred costs for complying with RPS, uncertainty in the manner in which such costs will be recovered is important. Uncertainty in the manner in which costs will be recovered is particularly troublesome as utilities begin moving further up the development cycle with wind projects. Potential Solution: Legislation requiring the WUTC to develop policies and procedures to provide guidance to utilities on how different types of prudently incurred development costs will be recovered in rates before utilities make such expenditures.
    - Exceeding RPS Targets: There are no clear regulatory policies that provide guidance on investing in renewable resources beyond the physical minimums

provided in the RPS if such resources are not "least cost" relative to thermal resources. Potential Solution: Legislation that clarifies utilities are entitled to recover costs of renewable resources in excess of the physical RPS targets that may be higher cost than thermal resources, as long as the utility demonstrates at the time of such investment, it is expected to be able to comply with the RPS physical targets in the future while remaining under the 4% of revenue requirement cap; i.e., allow utilities to use excess revenue cap capacity to invest in additional renewable resources;

- Research Development and Demonstration Costs: Recovering costs for research development and demonstration projects that may advance renewable/green technologies toward becoming more commercially viable is uncertain. Potential Solution: The WUTC could be required to establish policies, guidelines, and procedures for reviewing, approving, and establishing accounting treatment for utility proposed RD&D projects. The process should provide clarity in how costs of such projects will be recovered, provided the WUTC finds the projects were prudently managed.

- Transmission Cost Barriers: Renewable resources, especially wind, are generally located remotely from load centers. Current transmission expansion policies from BPA can be barriers to new wind development, in terms of timing, upfront costs, and possibly perceived credit worthiness of developers. Potential Solution: The state could provide no interest loans or loan guarantees to utilities and non-utility generators for upfront transmission charges.
- Transmission Siting Barriers: Building transmission over one or more local jurisdictions with differing and sometimes confusing standards can be a barrier. Potential Solution: Ensure EFSEC has siting authority over transmission.
- Interconnection Uncertainties: Requirements for interconnecting renewable resources with different utility transmission systems can be quite different across utilities. This uncertainty can create delays and cost uncertainties. Potential Solution: Establish statewide interconnection standards and cost recovery methodologies.
- Positive Incentives: Resolving regulatory uncertainty is generally good public policy that will help allow utilities to move toward more renewable resources. Making clear rules about when and how a firm will be punished is different than providing incentives. Utilities should be encouraged to acquire renewable resources—owned or purchased. The RPS provides the WUTC the option to use positive incentives, but it would provide a clearer signal to the WUTC if it were required to adopt incentives. Potential Solution: Utilities could be allowed to retain revenue from selling RECs generated/acquired in excess of those needed to comply with the RPS. This would provide positive incentives to comply with physical RPS targets early and in the long-term. Such an incentive could be coupled with the process described in "exceeding the RPS" to provide a cap on expenditures. Alternatively, utilities could be provided a rate of return kicker (or

financial equivalent for purchases) for renewable resources in excess of those needed for the RPS.

- **Goals:**
- **Timing:**
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

[Insert text here]

Related Policies/Programs in Place

See ES-2 below. See Senate Bill 6001 (April 2007), section 4d) and 4e),

Type(s) of GHG Reductions

[Insert text here]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-2. Distributed Renewable Energy Incentives and/or Barrier Removal

Based on ES Catalog Option 2.3 and RCI Catalog Option 6.1

This option will be considered jointly with the RCI TWG group.

Mitigation Option Description

Distributed electricity generation sited at residences and commercial and industrial facilities, and powered by renewable energy sources (typically solar, but also wind, small hydroelectric power sources, or biomass or biomass-derived fuels), displaces fossil-fueled generation and avoids electricity transmission and distribution losses, thus reducing greenhouse gas emissions. This policy can also encourage consumers to switch from using fossil fuels to using renewable fuels in applications such as water, process, and space heating. Increasing the use of renewable energy applications in homes, businesses, and institutions in Washington can be achieved through a combination of regulatory changes and financial incentives.

There are numerous barriers to distributed renewable energy, including inadequate information, institutional barriers, community barriers, limited number of qualified contractors, high technology costs high transaction costs because of small projects, high financing costs because of lender unfamiliarity and perceived risk, "split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc. The lack of recognition for emissions reduction value provided also creates obstacles. Policies to remove these barriers could include: improved interconnection policies, improved rates and fees policies, streamlined permitting, recognition of the emission reduction value, financing packages and bonding programs, power procurement policies, education and outreach, etc.

Potential technologies include: solar photovoltaic systems, solar water heating/space heating systems, wind power systems, particularly for rural areas, biomass-fired generation, space, or water heating systems.

Mitigation Option Design

Potential elements of this option could include:

- The primary barrier to new small DG is the high initial cost which must be borne by the customer-generator. Mitigation could include: WA tax credits for commercial operations; WA-supported no-interest loans to residential customers; and WA state rebates for the purchase of specified technologies.
- Washington already has uniform interconnection standards for small DG resources and net-metering laws. The existing regulatory construct can discourage direct utility capital investment in DG; those barriers should be examined, at least. Other "incentives" aimed at increasing market penetration of DG and certain energy efficiency technologies would

be more effectively targeted at utilities, rather than individual consumers; utilities could be encouraged to create the market if they (IOUs) have the proper incentives to do so.

- Incentives should be utilized where appropriate. Utility rates of return should be increased for these investments.
- For those that believe that the future really lies in a more distributed generation supply we must expand incentives and remove barriers to deploy more distributed technologies.
- There is support among some members of the Energy Supply TWG to amend I-937 to include organic pulping byproducts and waste-to-energy (WTE) as renewable fuels. I-937 proponents have concerns about opening up the initiative, in part because of the potential to undermine the original intent that now serves as a fundamental basis of GHG emission reductions in the energy supply sector. I-937 proponents also have concerns about air quality impacts of traditional methods of burning pulping liquors and even more so with WTE. SB 6001 is an example of a policy that explicitly favors pulping liquors as a carbon neutral source of power but without changing the definition of eligible renewables in I-937.
- Interconnection standards are based on federal, state and industry safety requirements. High interconnection costs and regulatory access barriers can be shifted from the customer-generator to the general population with appropriate legislation.
- Tax credits and other mechanisms to make distributed renewable resources more economically viable are important to develop non-traditional resource alternatives.

[The following are from RCI TWG comments]

- Training/certification programs for installers/contractors
- Net metering and other pricing arrangement programs
- Improving interconnection standards and reducing costs
- Encouraging the creation of and support for biomass fuels markets.
- Encouraging small scale renewable systems including biomass boilers, small scale wind, and geo-thermal.
- Possible amending of I-937, or other climate policies, to include organic pulping byproducts as renewable fuels.
- Incentives and barrier elimination, including avoided cost barriers for CHP.
- Tax credits, and/or utility or other incentives to lower the first cost of distributed energy systems to users. This could include expanding incentives offered under the existing law to residential consumers to include commercial systems, offering B&O tax credits for commercial- scale systems, and offering low- or no-interest loans for commercial and residential systems.

- Efforts to simplify and standardize permitting for industrial and large commercial DG systems, as well as support for County and city land use prescreening efforts to facilitate siting.
- **Goals:** Overcome barriers posed by high up-front costs of distributed generation systems. Expand use of systems in Washington, and promote stronger market for Washington's solar energy industry.
- **Timing:** Many of the incentives, including loan subsidies, could be implemented in the 2009 legislative session, when the next biennial budget is drafted by the legislature.
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

- State incentive funds and low or no interest loan programs subsidized by the state.
- Expansion and/or extension of tax incentives provided under SB 5101 (2005).

Related Policies/Programs in Place

In 2005, the Legislature enacted the Renewable Energy System Cost Recovery (RCW 82.16.110) and Tax on Manufacturers or Wholesalers of Solar Energy Systems (RCW 82.04.294). The legislation provides incentives for the purchase of locally-made renewable energy products and provides a preferential rate under the business and occupation tax. Furthermore, tax exemptions under RCW 82.08.02567 and RCW 82.12.02567 incent the purchase and use of machinery and equipment used directly to generate electricity using fuel cells, wind, sun, or landfill gas. Similarly, RCW 82.08.835 and RCW 82.12.835 incent the purchase and use of solar hot water systems.

Incentive payments are provided by electric utilities to customers generating renewable energy (i.e., solar, wind) on their property. For example, the Chelan County PUD Sustainable Natural Alternative Power Producers Program encourages customers to install power generators such as solar panels and wind turbines and connect them to the PUD distribution system; Avista Utilities provides a production credit of 14 cents per kWh for one year; Bonneville Environmental Foundation Green buys "tags" for five cents per kWh for up to five years.[1]

[1] PSE offers two incentive programs that provide ongoing, annual benefits. Net Metering (Schedule 150) allows the energy produced by a customer's renewable-energy system to offset the customer's usage of PSE-provided electricity over the course of a year at the retail rate of ~9 cents per kWh. For months in which a customer's self-generated renewable energy exceeds the amount of PSE electricity consumed, that excess production is rolled over to offset PSE power usage in other months. Typically, high summer production of renewable energy can offset high winter usage of PSE-provided power. In addition to Net Metering, PSE elected to create a separate incentive program as authorized by State Senate Bill 5101 (2005) and Washington Administrative Code 458-20-273. PSE provides all of the consumer benefits allowed under the

Type(s) of GHG Reductions

The primary GHG reduced is CO_2 from avoided fossil fuel consumption. As today's market includes a high level of interstate trading, the WECC[2] grid average of 1.1[3] pounds of CO_2 per kWh (equal to 0.55 Tons per MWh)

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):** Likely dependent on how key uncertainties noted below are resolved over time. Level of contribution to long term goals dependent on how broadly DG technologies are utilized, which are in turn highly dependent on per kW cost of systems.
- **Job Creation:** Washington is home to many companies, such as RES and Xantrex, that manufacture solar energy and other DG system components. Expansion of the market for DG systems should help grow this fledgling industry in Washington and create more jobs in places like Moses Lake, Arlington and Vancouver.
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

Growth in utilization of DG technologies will depend, in part, on new technologies, increased manufacturing efficiencies with existing technologies and increase in markets to drive economies of scale that will reduce system costs.

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

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state law. The PSE program (called the Renewable Energy Advantage Program under Schedule 151) provides a payment for Production Metering. The purpose of this program is both to encourage small-scale renewable-energy generation and to induce in-state production of renewable-energy system components. The Production Metered payments to customers can range from 12 cents/kilowatt hour (kWh) to 54 cents/kWh if the parts of a particular renewable energy system were manufactured in Washington. The law set an annual cap of $2,000 in incentive payments per installation.

[2] Western Electric Coordinating Council

[3] http://www.epa.gov/cleanenergy/egrid/index.htm: eGRID2006 Version 2.1

[*CCS Note: Following moved from "Level of Group Support" category, which is reserved for reporting on results of CAT deliberations*]

High level of consensus on incentives.

[*CCS Note: Following moved from "Barriers to Consensus" category, which is reserved for reporting on results of CAT deliberations*]

Disagreement among parties on opening up I-937 eligibility to pulping liquors and WTE.

Status of Group Approval

TBD [*Reserved for reporting on approval by CAT*]

Level of Group Support

TBD [*Reserved for reporting on approval by CAT*]

Barriers to Consensus

TBD

ES-3. Efficiency Improvements, Capacity Additions and Fuel Switching at Existing Renewable and Fossil Power Plants

Based on ES Catalog Options 2.9 and 3.3

Mitigation Option Description

Efficiency improvements refer to increasing electric generation output at existing projects through incremental improvements at existing renewable projects (e.g. hydro, biomass, solar or wind) and at existing fossil plants (e.g., more efficient boilers and turbines, improved control systems, or combined cycle technology). Efficiency improvements at existing projects include incremental operational and equipment changes that result in more electric energy output using the same amount of fuel.

Capacity additions refer to adding electric generation capacity to any existing renewable projects. Fuel switching refers to switching to lower or zero emitting fuels at existing fossil plants, This may include the use of biomass or natural gas in place of coal or oil. (repowering is not fuel switching)

Policies to encourage efficiency improvements, capacity additions and fuel switching at existing plants could include: new policies and principles, new laws and regulations, market-driven incentives, and financial incentives.

Mitigation Option Design

- Focus on efficiency improvements, capacity additions and fuel switching and existing renewable and fossil facilities. This could also include co-firing with biomass
- Need to clarify financial incentives. Favor utilizing incentives where appropriate.
- Under I-937, a utility cannot count against the renewable energy standard RECs from a hydro upgrade made by a qualifying utility, or the output from a hydro upgrade made by a nonqualifying utility. These restrictions should be removed. Incentives should be made to maximize hydro generation capacity!
- Establish market standards that prevent potential double-counting of renewable energy generation.
- It is important to acknowledge the value of existing fossil-fueled resources provide for cost-effective and reliable service. Is there a way ensure that capital expended on these resources can be recovered while also facilitating a transition to lower GHG emitting resources? The eligible $/MWh for efficiency projects should be adjusted to reflect the value of avoiding GHG emissions during any pre-approval or prudence review.

- Incentives should be provided using investment and production tax credits, government loan guarantees, low interest loans and grants. Oregon's Business Energy Tax Credit system works well to encourage renewable energy generation and energy efficiency projects at commercial sites and industrial plants.
- A system that incorporated changes in Washington's B&O tax to provide tax incentive credits similar to BETC could provide the tipping-force to more GHG reduction projects forward.
- *Need to assure financial incentives are equally available to both private and publicly-owned utilities.*
- Efficiency improvements, capacity additions and fuel switching are effective ways of achieving lower GHG emissions and should be encouraged as part of state policy. For example, explicit credit for GHG emission reduction could be a part of the prudence decision-making process, which could then result in more such improvements occurring.
- Avoided GHG emissions attributable to efficiency improvements, capacity additions and fuel switching at existing plants prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a regional mechanism to achieve GHG reductions.
- **Goals:** To encourage the most effective and efficient use of existing energy generation resources in Washington and the Northwest.
- **Timing:** To establish policies on or before January 1, 2009.
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

- Policies and Principles – establish policies and principles through the Governor that define and promote efficiency improvements at existing projects. Encourage optimal use of our existing resources and investments in new resources.
- Laws and Regulations – develop implementing legislation or guidelines that provide the necessary market-driven incentive to accomplish overall goal.
- Market-driven incentives – provide incentives through future environmental attributes market (e.g. renewable energy credits, green power, and carbon offsets) that encourage and reward the efficient use of our energy resources.
- Financial incentives – provide incentives through reduced taxes and low-interest loans and other financial incentives.

Related Policies/Programs in Place

- Senate Bill 6001 (April 2007), sections 4c) and 11.
- Implementation of the Energy Independence Act (RCW 19.285)

Type(s) of GHG Reductions

- [*Potential CCS edit for clarity*: *Reduction of combustion-related emissions (largely CO_2, but also NO_x and other GHGs) from the displacement of electricity produced from*] the use of fossil fuels through operational and equipment efficiency improvements at low- or non-emitting projects, new generation at existing projects, and new renewable energy projects.
- Reduce emissions at existing projects that use fossil fuels through conversion to use of low emitting fuel types, efficiency improvements and other technical solutions to reduce emissions.

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
  - Northwest Regional Forecast of power loads and Resources, August 2007 – July 2017, PNUCC
  - U.S. Energy Information Administration (EIA), Various Reports
  - Assessment of Waterpower Potential and Development Needs, March 2007, EPRI
- **Quantification Methods:**
  - Determine the overall capacity of existing projects (MWh) and estimate the potential efficiency improvements (MWh)
  - Estimate the potential capacity additions at existing projects (MWh)
  - Estimate the potential new capacity of low- or non-emitting projects (MWh).
- **Key Assumptions:**
  - Conversion of MWh to $MtCO_2e$
  - Estimates of potential efficiency improvements, capacity additions, and new projects

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
  - Overall increase in energy (MWh) will replace the need to use fossil fuels or reduce the use of high-emitting resources.
- **Job Creation:**
  - Implementation of efficiency improvements will produce high-quality technical and trade jobs.
- **Reduced Fuel Import Expenditures:**

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Key Uncertainties

[Insert text here]

Additional Benefits and Costs

- In 2007, the overall energy load of the Northwest was approximately 22,000 aMW and the overall energy generation was 21,000 aMW. Approximately 70 percent of the energy generation was from non-emitting resources and 30 percent was from natural gas and coal. If existing projects were able increase energy generation by approximately 10 percent through efficiency improvements, an additional 2,000 aMW would be available to replace the use of fossil fuels.
- In Washington state, the overall energy load was approximately x,000 aMW and the overall energy generation was x,000 aMW. Approximately xx percent of the energy generation was from non-emitting resources and xx percent was from natural gas and coal. If existing projects were able increase energy generation by approximately 10 percent through efficiency improvements, an additional x,000 aMW would be available to replace the use of fossil fuels.
- In Washington state, it is estimated that there are approximately xxxx aMW of new low- or non-emitting resources being proposed and there are approximately xx aMW available to be developed.

Feasibility Issues

- The estimated percent of efficiency improvements needs to be confirmed. An energy audit of existing projects to identify operational and equipment efficiency improvements and to identify new generation resources needs to be completed. Potential energy savings (aMW) and expected costs associated with those savings needs to collected and compiled before informed decisions can be made.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-4. Technology Research, Development & Demonstration and Technology-Focused Initiatives

Based on ES Catalog Options 1.6, 2.8, and 3.4.

Mitigation Option Description

Drive advances in technologies that would develop cleaner energy supplies and make existing fossil fuel energy sources less GHG emitting. Encourage deeper investments in implementation opportunities for these new technologies. Establish an emerging energy technology program to set the stage for wider-scale adoption of these emerging and break through clean energy and efficiency technologies.

Mitigation Option Design

- Establish an emerging energy technology program to help develop and deploy advanced technologies:
  - Provide opportunities and incentives to invest in, test, and deploy new technologies.
  - Promote research and development of cost-effective breakthrough technologies.
  - Support technology demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use.
- Criteria for the Program
  - Program investments must target efforts that reduce GHG, reduce energy imports and create clean energy jobs and economic development.
  - Increase collaboration between existing institutions for RD&D on technologies and support public and private partnerships. Create centers of technology excellence.
  - Use an Open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology).
- The emerging energy technology program should be inclusive of legitimate technologies that among others, result in:
  - Efficiencies in power generation, fuel transport and co-firing
  - Advance energy storage systems
  - Carbon capture, storage and reuse
  - Alternative clean energy development

- **Goals:**
  - Build on existing state partnerships and initiatives. $10 million Emerging Energy Technology fund for advanced clean energy technologies.
  - Shared funding partnership with state, federal, and private sector partners to ensure the most effective deployment of these technologies.
- **Timing:**
  - Establish funding in the 2008 legislative session. First RFP issued January 2009.
- **Coverage of parties:**
  - State agencies, Washington Universities, private companies, utilities, Federal laboratories
- **Other:**

Implementation Mechanisms

- State program that partners with all levels of government, utilities, energy suppliers, and technology development companies.

Related Policies/Programs in Place

See Senate Bill 6001 (April 2007), various sections.

Northwest Energy Technology Collaborative

Washington Technology Center

Washington State University Energy Extension Service

Community Trade and Economic Development - Energy Policy Division

Pacific Northwest National Laboratory

Type(s) of GHG Reductions

Carbon Dioxide

Methane

Sulfur hexafluoride

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**

- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-5. Carbon Capture, Storage, and Re-use Incentives, Requirements and/or Enabling Policies and Research & Development

Based on ES Catalog Options5.1, 5.2, and 3.1b.

Mitigation Option Description

Carbon dioxide (CO_2) capture and storage or reuse (CCSR) is a process consisting of the separation of CO_2 from industrial and energy-related sources, transport to a storage location and long-term isolation from the atmosphere. The CO_2 from large point sources can be compressed and transported for storage in geological formations, in the ocean, in mineral carbonates, or for reuse in industrial processes. Captured carbon can be reused for enhanced recovery of oil and gas extraction or as a feedstock for industrial processes.

Key components of this option would include:

- Identify and develop post-combustion carbon capture technologies
- Identify and develop potential carbon sequestration technologies reservoirs
- Algae [*Potential CCS clarifying edit: capture in algal biomass of carbon dioxide from exhaust gases that has been absorbed in water, probably with sequestration or reuse of algal biomass*]
- Identify and develop CO_2 transmission and reuse technologies
- Identify and recommend policies for CO_2 storage that consider the implications of future liability - including state permitting, issues regarding short and long term liability

Mitigation Option Design

Technological and financial barriers exist to implementation of CCSR. While separation, capture and transport of CO_2 are mature technologies only three industrial-scale storage projects are currently in operation. Further R&D funding to improve CCSR technologies and evaluation studies to identify geologically sound reservoirs will be needed.

A broad regulatory framework is required that supports the identification, development and deployment of technologies that capture, sequester or reuse CO_2. For Washington State, and the USA, to achieve CO_2 goals a multi sector approach is required, but within the electricity supply sector three technologies are emerging as near term scalable technologies.

- Post CO_2 Combustion Capture
  - Technologies

- Do not try to pick a single winning technology. It is important to create a framework in which industry will invest in a broad range of low emitting technologies. It will take a sum total of all technologies to achieve long-term CO_2 reduction roles
- Proper incentives allow and encourage industries to take early risks inherent in new technologies. A broad range of incentives should be pursued which will apply to different technologies, and technologies at different stages of deployment.
- In the absence of long-term clarity, higher emitting generation will likely continue to be built, and may face extraordinary environmental costs later in life. Effort must be made to avoid stranding assets due to the financial implications on utility companies and the end customers.
- Current and new policies must be able to adapt to the latest changes, and continue to adapt as technology continues to be developed and implemented. Failure to do so is likely to stall, if not impede, the construction of billion of dollars of productive infrastructure in the US.
- Three technology branches appear to offer the best near-term solution to low-GHG emitting base load electricity:
    - Ultra supercritical [*coal-fired generation*] with carbon capture
    - IGCC [*integrated gasification combined-cycle plants using coal, sometimes with biomass co-firing*] with carbon capture
    - Nuclear [*power*]
- The net reduction of emissions to the atmosphere through CCSR depends on the fraction of CO_2 captured, the increased CO_2 production resulting from loss in overall efficiency of power plants or industrial processes due to the additional energy required for capture, transport and storage, any leakage from transport and the fraction of CO_2 retained in storage over the long term. The most viable of these technologies today appears to be Integrated Gasification Combined Cycle (IGCC) combined with carbon capture and storage and reuse (CCSR) technology. There are also emerging CCSR technologies that show promise for capturing carbon emissions from traditional pulverized coal fired boilers. These emerging technologies include chilled ammonia scrubbing and oxy-fuel combustion. Carbon capture technologies have the potential to remove approximately 90 percent of a coal plant's CO_2 emissions.
- R&D for the CCSR technologies is also vital for their larger scale commercialization. R&D funding can also be made available to CCSR technologies through an open bidding procedure (i.e., driven by bids received rather than by a focused strategy to develop a particular technology.) Funding can also be given for demonstration projects to help commercialize technologies that have already been developed but are not yet in widespread use. Funding could be provided to increase collaboration between existing institutions for R&D on these technologies.

- CO_2 Storage
  - Technologies
  - Liability

- There are significant legal barriers to carbon sequestration related to environmental and other legal liability and property rights. Many of these fall into areas traditionally governed by state law and, hence, must be addressed if carbon sequestration is to become reality in the state.
- Avoided GHG emissions attributable to CCS equipment placed into operation prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a regional mechanism to achieve GHG reductions
- Emphasize the need for Washington to support near term CCS demonstration projects (Similar to the arguments in the PacifiCorp white paper).
- Washington's large basalt formation may hold significant CO_2 sequestration capacity. Developing a carbon sequestration industry in Washington will bring long-lasting benefits. Industries created around reusing CO_2 should also have a high priority.
- There are significant technological challenges associated with post-combustion capture. Consequently, if this technology is going to emerge it will require much broader support than simply a state-led initiative.

- CO_2 Transmission
  - Technologies
  - Pipeline infrastructure

- CO_2 Reuse
  - Technologies
    - EOR
    - Petrochemical

- CO_2 Avoidance
  - Nuclear

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a. The Need for a Comprehensive Legal and Regulatory Framework for CCSR.

CCSR raises new legal and regulatory risks associated with siting and permitting projects, CO_2 transportation, injection and storage.[4] These risks are not yet fully understood, nor are uniform standards or government regimes in place to address and mitigate them. Among the key questions to be addressed in the development of a consistent regulatory framework for CCS are: immunity from potentially applicable criminal and civil environmental penalties; property rights, including the passage of title to CO_2 (including to the government) during transportation, injection and storage; government-mandated caps on long-term CO_2 liability, insurance coverage for short-term CO_2 liability; the licensing of CO_2 transportation and storage operators, intellectual property rights related to CCS, and monitoring of CO_2 storage facilities.

California recently adopted AB 1925, directing the California Energy Commission to recommend standards to accelerate the adoption of long-term management of industrial CO_2.[5] Washington should similarly develop guidelines for addressing the emerging legal and regulatory issues associated with carbon capture and sequestration. Among the options it should explore is that adopted by Texas, which transfers the title (and any liability post-capture) to CO_2 captured by CCS to the Railroads Commission of Texas.[6] New Mexico Governor Richardson's Executive Order 2006-69 required the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) to coordinate with a stakeholder group to explore and identify statutory and regulatory requirements needed to geologically sequester anthropogenic CO_2. The group recently published an interim report[7] that identifies the issues and challenges that must be addressed by potential statutory and regulatory changes, to identify questions, concerns and recommendations made by the stakeholder group, and to present preliminary findings and research to date for further policy development. A final report, with findings and recommendations, is due on December 1, 2007. The approach and process undertaken in New Mexico could be easily replicated in Washington.

- **Goals:** Executive Order or legislation directing state agencies to identify regulatory and legal barriers to the commercialization of CCSR projects. The final product could be a report to either the Governor or the legislature.
- **Timing:** 2008 or 2009
- **Coverage of parties:** Primarily focused on state regulatory agencies.

[4] Robertson, K., Findsen, J., Messner, S., Science Applications International Corporation. June 23, 2006. "International Carbon Capture and Storage Projects Overcoming Legal Barriers", prepared for the National Energy Technology Laboratory (see http://www.netl.doe.gov/energy-analyses/pubs/CCSregulatorypaperFinalReport.pdf)

[5] California AB 1925 (2006), located at http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_1901-1950/ab_1925_bill_20060926_chaptered.

[6] Texas H.B. 149 (2006).

[7] See, http://www.emnrd.state.nm.us/OCD/documents/InterimReportCO2Sequestration.pdf

- **Other:**

b. The Traditional Least-Cost/Least Risk Regulatory Standard Should Be Modified to Allow Development of CCSR Projects.

PacifiCorp's 2004 Integrated Resource Plan Update analyzed the costs of an integrated gasification combined cycle (IGCC) plant equipped with CCS technology. This analysis demonstrated that a CCS-ready, IGCC plant costs at least 16.9% more than a supercritical pulverized coal plant.[8] Additionally, while reliable estimates for carbon geologic sequestration costs do not yet exist, the Department of Energy's research program goal is $10 per MWh.[9]

IOUs in Washington are subject to a least cost standard for new resources.[10] Additionally, Washington IOUs are required to implement their integrated resource plans through competitive bidding to ensure implementation of this least cost policy.[11] Because the costs of CCSR technologies are new and not required by current law, investment is difficult to justify under a least cost/least risk standard. Washington should eliminate this barrier to CCSR technologies for IOUs by adopting a "reasonable and necessary" standard for CCSR technologies used to serve Washington customers, in place of a least cost/least risk standard. Indiana adopted a similar approach, requiring the Indiana Utility Regulatory Commission to encourage the development of IGCC and CCS as long as it concludes that the projects are reasonable and necessary.[12]

- **Goals:** Executive Order or legislation directing the Washington Utilities and Transportation Commission to change the least cost/least risk regulatory standard in order to advance the use of CCSR technologies.
- **Timing:** 2008 or 2009
- **Coverage of parties:** Washington Utilities and Transportation Commission, investor-owned utilities and interested stakeholders
- **Other:**

[8] PacifiCorp 2004 IRP Update at 24, supra note 5.

[9] *Id.*

[10] *See In re Least Cost Planning for Gas and Electric Companies*, WUTC Docket Nos. UE-030311, UG-030312 (July 25, 2006) (amending WAC 480-100-238, which provides that electric utilities have the obligation to meet their system demand with a least cost mix of resources.)

[11] *See In re Chapter 480-107 WAC*, Docket No. UE-030423 (March 31, 2006) (amending/enacting competitive bidding rules, including WAC 480-107-015 requiring the filing of an RFP after an integrated resource plan).

[12] IC 8-1-8.8-11(a), provides that "The Commission shall encourage clean coal and energy projects by creating the following financial incentives for clean coal and energy projects, if the projects are found to be reasonable and necessary."

c. Washington Should Enact Tax Incentives for the Use of CCSR Technologies Prior to Any Legislative Mandates.

Washington should enact state or jointly advocate for federal tax incentives to encourage new CCSR project development to serve Washington customers. The most effective combination of tax incentives for IOU development of CCSR technologies is a tax credit plus accelerated depreciation.

- **Goals:** State legislation and/or coordination with the Washington Congressional delegation advocating new tax incentives to encourage the commercialization of new CCSR technologies.
- **Timing:** 2008 or 2009
- **Coverage of parties:** multiple parties
- **Other:**

d. The Added Risks and Financing Challenges of CCSR Should Be Mitigated With Assured, Timely Cost-Recovery.

The developmental nature of CCSR technologies creates added risk and cost during the pre-construction phase, in construction of the project and in the power plant's performance. Because commercial-scale CCSR technologies are new, the risk of cost-overruns, construction delays and delays in achieving anticipated performance levels are significant.

This added risk and cost create financing challenges for CCSR investment. Assured, timely cost recovery, typically achieved by "pay as you go" proposals, is necessary for large CCSR projects to obtain financing and move forward. Washington should adopt a full and timely cost-recovery standard for IOU investment in CCSR technologies used to serve Washington customers. RCW 80.04.250, Washington's "used and useful" statute, generally precludes recovery for capital investments, however, unless a plant is operational.[13] To mandate "pay as you go" cost recovery for CCSR investments, Washington's clean coal legislation would need to create a limited exception to this statute for CCSR investments. Colorado, Indiana and Pennsylvania all provide full cost-recovery assurances for IGCC and CCS by statute; Colorado additionally includes recovery for replacement power costs associated with unplanned IGCC/CCS plant outages.[14]

- **Goals:** Executive Order or legislation directing the Washington Utilities and Transportation Commission to implement changes to Washington's "used and useful"

[13] RCW 80.04.250 requires investments included in rates to be "used and useful for service in [Washington]." The statute contains a limited exception for construction work in progress, allowing recovery in rates upon a finding that recovery is in the public interest.

[14] Colorado House Bill 06-1281; Indiana IC 8-1-8.8; Pennsylvania SB 1030.

statute, mandating "pay as you go" cost recovery for CCSR technologies, in order to advance their commercialization.

- **Timing:** 2008 or 2009
- **Coverage of parties:** Washington Utilities and Transportation Commission, investor-owned utilities and interested stakeholders
- **Other:**

e. Credit for Early Action is Critical When Designing CO_2 Cap and Trade Rules.

Avoided GHG emissions attributable to CCSR technologies placed into operation prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a state or regional mechanism to achieve GHG reductions.

- **Goals:** Executive Order or legislation directing the stating the position of Washington is to ensure credit for early action for CCSR technologies within any proposed cap and trade rule being developed either by the state of Washington or jointly developed in partnership with neighboring western states (e.g., Western Climate Initiative), in order to advance their commercialization.
- **Timing:** 2008
- **Coverage of parties:** Primarily the state agencies participating within the Western Climate Initiative, but other interested stakeholders as well.
- **Other:**

Implementation Mechanisms

[Insert text here]

Related Policies/Programs in Place

See Senate Bill 6001 (April 2007), sections 4b and 7.

Type(s) of GHG Reductions

[Insert text here]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-6. Transmission System Capacity, Access, Efficiency, and Smart Grid

Based on ES Catalog Options 6.1, 6.2, and 6.5.

Mitigation Option Description

This option comprises three main elements: 1) improving access and limiting barrier to the grid by distributed, small-scale and other clean energy technologies for electricity generation; 2) increasing energy efficiency measures to reduce the transmission and distribution line losses of electricity; and 3) Use of technology to optimize the electricity grid through devices that control electricity demand and supply based on events throughout the grid.

Mitigation Option Design

- Issues associated with "access" and "planning" are subject to FERC jurisdiction and may not be appropriate to explore in the CAT venue.
- Increased transmission system capacity is critical for the development and integration of renewable energy. Although transmission is regulated at the federal level, state policies should encourage such investments.
- According to the Wind Integration Study conducted by the Northwest Power Planning and Conservation Council, the amount of transmission capacity that is currently available to Northwest wind projects is only sufficient to support anticipated development through 2009. Additional transmission capacity will be needed to achieve the 6,000 MW of wind envisioned in the Council's plan and to open up new areas for wind development that will diversify wind production. This diversity can reduce total variability and therefore lower the cost of wind integration on a $/MWh basis. It can also provide access to higher capacity factor wind resources, which can lower the busbar costs of wind generation.
- Products and strategies that make better use of existing transmission lines, such as conditional firm and voluntary economic redispatch, may enable new wind projects to come on line before new transmission lines are constructed, or extend the time until transmission construction is required.
- It is critical that Washington policies not create barriers to new transmission "capacity", which is especially critical for renewables. Initiatives should be especially focused on intermittent resources
- Elements of smart-grid technology are needed to unlock additional renewable resource alternatives.
- *[from Energy Supply Catalog Descriptions] Initiatives include conditional firm pricing for clean/distributed energy and planning for additional intermittent (wind) generation.*

- *Utilities use a variety of components throughout the transmission and distribution system to reduce losses. Increasing the efficiency of these components can further reduce losses. Vermont State, for example, offers a rebate to encourage users to install energy efficient transformers. Regulations, incentives, and/or support programs can be applied to achieve greater efficiency of transmission and distribution system components.*
- *Measures to improve transmission systems to reduce bottlenecks and enhance throughput may be required to satisfy long-term electricity demands. Opportunity exists to increase transmission line carrying capacity as much as threefold through the implementation of new construction and retrofit activities on the transmission grid including incorporating advanced composite conductor technologies, capacitance technologies, and grid management software. Siting new transmission lines can be a difficult process given their cost and their actual or perceived impact on health, environment, and the use, enjoyment, and value of property. Policy measures in support of this option could provide incentives to utilities to upgrade transmission systems and reduce barriers to siting of new transmission lines. This option could also include reductions in use and leakage of SF_6 from distribution system transformers, plus efficient transformers and other materials and equipment.*
- *Smart Grid technologies can involve devices that "turn off" non-essential power when demand, and subsequent electricity prices, are high. Also technologies are used to co-ordinate a range of small scale distributed generation (including electric vehicles) and/or intermittent power, such as wind.*[15]]
- **Goals:**
- **Timing:**
- **Coverage of parties**
  - Electric Utilities
  - Utility and Transportation Commission
  - Bonneville Power Administration
  - Northwest Power and Conservation Council
  - Northwest Power Pool or other regional transmission authorities and regional control area operators.
  - Coordinate with:
    - Northwest Energy Technology Collaborative
    - Northwest Center for Electric Power Technologies
    - Western Regional Climate Action Inititive
    - Energy Facility Site Evaluation Council

[15] www.climatesolutions.org/pubs/pdfs/PoweringtheSmartGrid.pdf

- **Other:**

Implementation Mechanisms

- Regulatory obstacles exist for IOUs, especially if deploying new technologies means retiring resources that have not been fully depreciated or that are still operating cost-effectively. These obstacles could be examined and removed. Financial incentives could also be made available for utilities to deploy their capital on significant T&D efficiency measures.

Incentives should be established to encourage deployment of capital for T&D efficiency improvements, including smart-grid technologies.

The information below is from the Poised for Profit in Clean Energy Report: Powering Up the Smart Grid, by Patrick Mazza.

- Today's power grid is dramatically underutilized compared to its capacity:
  Generation - U.S. power plants number over 9,000 and have a 2001 book value of $570 billion. They can produce up to 819 gigawatts of power but are only utilized at 53% of that capacity.
  Transmission - The U.S. transmission network, over 700,000 miles of line worth $64 billion, is used at 50% of capacity.
  Distribution - Local wire networks totaling over one million miles and worth $160 billion have utilization rates under 30%.
- The electric power industry is saddled with an aging infrastructure, approximately 60% of which will need to be replaced in the next 10-15 years at a huge cost to companies.

Policy Recommendations

- **Provide financial incentives for implementing smart energy technologies** – Utilities are often hesitant to apply the latest technologies due to risk factors. One way to overcome this is to provide higher returns for bringing new smart energy solutions on line, including distributed generation, combined heat and power, load management and end-use efficiency. Utility regulators should work with utilities to identify smart energy technologies with ratepayer benefits including improved reliability and efficiency, and environmental benefits in terms of reduced emissions. In recognition of these broad benefits, regulators should allow or provide utilities financial incentives for implementing new technologies sufficient to overcome risk factors.
- **Break the link between energy throughput and profits** – Utilities are hesitant to apply new technologies because they reduce the gross amount of energy throughput, either by improvements in efficiency or customer-side power generation. Utility ratemaking fortifies the hesitancy by setting pricing and revenues on the basis of cents per kilowatt hour. This ratemaking generally gives utilities a financial incentive to increase kilowatt throughput even if measures to reduce throughput reduce the total cost of providing service. Utility regulatory commissions should remove these disincentives by breaking

the link between utilities' electricity and gas sales and their profits. This can be accomplished through small annual trueups in rates to ensure that unexpected changes in sales do not affect the utility's ability to recover costs approved by its regulators. This involves comparing actual sales to those predicted when rates were set, and adjusting rates up or down to ensure that authorized revenues are collected (no more, no less). This is also known as decoupling. Any such system must be carefully designed to avoid unintended consequences and provide returns that are fair to all parties. Decoupling plans can and should be designed to provide winwin solutions for utilities and ratepayers. The Northwest has one operating model of decoupling in gas rates set for Northwest Natural.

- **Employ performance-based ratemaking to provide positive incentives –** Decoupling removes disincentives for utilities to implement measures that reduce energy throughput. Performance-based ratemaking is a complementary measure that offers positive financial incentives for utilities to promote such measures. Utilities and regulators target specific accomplishments such as an amount of energy to be saved through efficiency programs. For meeting or exceeding goals utilities gain rewards on the bottom line. Rhode Island, Massachusetts, New Hampshire and Kentucky have set up notable efforts in this area.32
- **Improve grid efficiency with incentives to reduce line losses –** Power systems generally involve line losses, but if utilities are authorized to collect 100% of line loss costs from customers, there is little incentive to run the grid for top efficiency. Utility regulatory commissions should mandate that utilities optimize transmission and distribution networks for minimum line losses. Commissions should deny cost recovery for losses above this level.
- **Apply least cost planning to power delivery as it has been applied to generation** – Planning to identify least cost options for power supply, whether generation or efficiency, was pioneered in the Northwest. But least cost planning has not yet fully come to power delivery systems. Utility regulatory commissions should update rules governing Integrated Resource Plans (IRPs) to require gas and electric utilities to apply least-cost planning principles to proposed transmission and distribution investments. Rules should ensure that utilities fairly and transparently assess non-wires options including clean distributed generation, combined heat and power, demand response and peak shaving. The Washington Utilities and Transportation Commission has opened a rulemaking process to update the integrated resource planning rules and request for proposals rules (UE-030311 / UE-030423 / UG-030312). This is a key opportunity for input and influence.
- **Make sure utilities account for climate change and other risks to bottom lines** – Integrated Resource Plans are beginning to take into account potential costs for emitting carbon into the atmosphere. Notable examples are IRPs created by PacifiCorp, Puget Sound Energy and Idaho Power. When carbon emissions carry a price, it levels the playing field for clean generation and efficiency technologies. Utility regulators should insist all IRPs assign a cost to carbon dioxide emissions based on risk of future regulation and take into account fuel price volatility. The WUTC rulemakings mentioned above will also consider inclusion of guidelines for evaluation of additional risk factors such as

fossil fuel and wholesale electric market price volatility, fossil fuel supplies, hydroelectric supply and other significant power rate spike threats. The Oregon Public Utility Commission has a rulemaking open to update its IRP rules to include more evaluation of risk (UM 1056).

Public utility governing bodies have policy options to unleash smart energy benefits for their ratepayers. Smart energy technologies bring many benefits to ratepayers including improved reliability and rate control. Public utility governing bodies can take a number of steps to secure those benefits:

- Designate staff to track and recommend emerging technologies of potential benefit to ratepayers including distributed generation, combined heat and power, load management and end-use efficiency.
- Place these "non-wires" technologies on a level playing field when considering upgrades in traditional pole and wire infrastructure. Study all options in a least-cost planning format.
- Place a priority on employing smart grid technologies such as voltage reduction to optimize delivery networks for minimal line losses.
- Work with public utility organizations, clean energy advocates and Bonneville Power Administration to overcome obstacles to local generation created by interconnection rules and losses of BPA power allocations.
- Public utilities involved in fossil-fired generation should assess risk of future costs on carbon emissions in their long-term planning.

Northwest Wind Integration Action Plan, conducted by the Northwest Power and Conservation Council: http://www.nwcouncil.org/energy/Wind/library/2007-1.pdf
Major findings related to transmission:

- Control area cooperation and improved markets will lower cost and increase availability of integration services.
- Existing transmission capacity can support anticipated wind development (~3000 - 3800 MW) through 2009.
- Transmission expansion, firm/non-firm products and new regulatory policies needed to serve 6000 MW and to increase diversity.

There are steps we can take to increase integration capability and to lower integration costs. The cost of wind integration services can be reduced through generally four types of actions: (1) developing more cooperation between regional utilities to spread the variability of wind more broadly; (2) developing markets that will reward entities who choose to market their surplus flexibility; (3) making more low-cost flexibility such as that provided by hydroelectric resources available; and (4) development and application of new flexibility technologies. Achieving these

goals will require coordinated actions similar to those required to establish the Pacific Northwest Coordination Agreement of the Columbia River Treaty. Fortunately, the region has a long history of forging cooperative agreements designed to increase the size of the pie for all regional consumers that can provide a model for what will be needed over the next several years to address wind integration issues.

One of the action items from the Wind Integration Action Plan call for the "four Northwest state regulatory commissions to review and amend as necessary regulatory policies to remove barriers to more efficient use of transmission for wind and other renewable resources." The plan also states the "Northwest Power and Conservation Council, working with BPA and other interested organizations, should establish a Northwest Wind Integration Forum to facilitate implementation of the actions called for in this *Action Plan.*"

Related Policies/Programs in Place

Type(s) of GHG Reductions

There are emissions reductions related to improved operations of electric power generation and improved access for renewables. By some estimates, the power grid is utilizing about 50% of available capacity. Additionally, the electric power transmission and distribution system releases significant amounts of SF_6 (sulfur hexafluoride), which has the highest 100-year Global Warming Potential of any gas (23,900 times that of CO_2).

Emissions of SF_6 related to electric power transmission and distribution from WA GHG inventory (Million Metric tons CO_2 equivalents):

0.8
0.8
0.7
0.8
0.7
0.6
0.6
0.5
0.4
0.5
0.4
0.3
0.3
0.3
0.3

Nationwide and statewide, SF_6 emissions have fallen since 1990. The downward trend in SF_6 emissions since 1990 is the result of industry efforts to reduce emissions from electrical power

systems, as well as the rising cost of SF_6. In contrast, emissions of SF_6 from uses in the semiconductor manufacturing industry doubled from .02 $MMTCO_2e$ to .04 $MMTCO_2e$ since 1990.

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**
- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:** The Poised for Profit II Partnership found at least 225 companies in the Northwest representing 14% of the $15 billion global smart energy market. Additionally, the high regional concentration of software, semiconductor and wireless companies could find new opportunities and innovation in the energy sector.
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

[Insert text here]

Additional Benefits and Costs

- Could eliminate $46-$117 billion in US peaking infrastructure investments over the next 20 years. (Poised for Profit in Clean Energy Report: Powering Up the Smart Grid, Climate Solutions, pg 8)
- Improves reliability of power grid
- Reduces losses from power lines
- Improves ability to utilize waste heat from power generation.
- Improves utilization of renewable generation

Feasibility Issues

[*Text below moved by CCS from "Barriers to Consensus" section, which is reserved for reporting on barriers to consensus by the CAT]*

- Reliance on new technologies which require extensive field testing.
- Can create shift from centralized power production to localized power production.
- Can have disruptive impacts on traditional utility business models that base revenue flows on gross throughput. Regulatory and ratemaking framework could create disincentives for adopting new technologies.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-7. Combined Heat and Power and Thermal Energy Recovery and Use

Based on ES Catalog Options 2.5.

Mitigation Option Description

Combined heat and power and thermal energy recovery and distribution can reduce GHG emissions by increasing the overall efficiency of fuel use. There are opportunities to recover thermal energy from CHP, industrial or municipal waste heat or renewable energy sources. District energy systems provide a key infrastructure for conveying this "recycled" energy from the sources to energy consumers.

CHP is typically 1/3 more efficient than conventional stand-alone generating systems, where electric energy is generated and transmitted long distances from a centrally located generation facility. On-site CHP equipment is used to meet process system requirements, heating and cooling loads. The most efficient CHP systems provide generation efficiencies of 70-80%, a dramatic improvement over conventional power generation that currently averages 31% nationwide with associated reductions in GHG emissions. This increased efficiency of CHP results in related reduction in emissions of air pollution and carbon dioxide. In addition, transmission and distribution infrastructure costs plus transmission losses are generally eliminated with CHP because these facilities are located on-site at the load centers.

Per the USDOE study completed in 2004, the market penetration potential of repowering existing plus new CHP potential in Washington is MW's by 2020. CHP potential in the Northwest (WA, OR, ID and MO) is MW's by 2020.

Natural gas fuel savings for CHP include a an estimate by the California Cogeneration Council (testimony before the California Energy Commission) that 5,000 MW's of new CHP would reduce California's natural gas demands by 9%. The thermal efficiency for a CHP plant can be as high as 89%, significantly better than the 57% thermal efficiency associated with generating plant with a stand-alone steam boiler.

In addition, District Energy systems can also provide a key infrastructure for conveying this "recycled" energy from the sources to energy consumers.

Mitigation Option Design

CHP -- recovery ("recycling") of waste heat from power generation (through combined heat and power or CHP). In order to reap the benefits of CHP, WA State should adopt pro-CHP policies to increase CHP generation at a cost that is equivalent to the cost of CCT technology. Implementation of such policies, however, must not result in cost-shifts to other utility customer classifications, nor adversely impact the financial integrity of a utility.

Straw Policies	Actions	Supporting Specific Steps
CHP shall be the presumptive model for new fossil-fuelled power plants, with utilities required to demonstrate why CHP cannot be implemented.	Power dispatch shall be provided with reasonable protections within contract options that give balanced desired operating flexibilities for both CHP generator and the grid.	Utilities are required to demonstrate that CHP opportunities do not exist to meet the load.
Establish favorable economic incentives and policies to increase existing capacity through repowering of existing CHP generation capacity. Pro-actively encourage through incentives for both existing and new CHP generation, consistent with the Govenor's GHG objectives.	• Per a recent CA Commission decision, (D.07-01-039) CHP plants should receive 1,092 pounds of CO2 credits for each MW of electricity they generate. • WA should establish the following CHP credits under existing B&O tax system or form other sources to provide investment incentives similar to the $20 million per project tax incentives established under BETC system in OR: o Thermal efficiency - $7/MWh. o GHG savings of 1092 pounds of CO2 - $ 8/MWh. o T&D incremental cost savings plus 8% loss - $ 10/MWh. o Credit for not needing hydro backup compared with wind- $12/MWh. o Renewable fuel credit - $ 10/MWh. o System security distributed energy credit – $5/MWh.	Financial incentives to implement CHP programs including: • Siting Incentive Programs; • Low-cost bonding or loan guarantee programs; • Tax credits for *investment* in CHP; Design GHG trading so that -- • CHP systems are credited for their impact on total emissions by issuing allowances for both the heat and power production. • Allowance allocations should recognize the total emission reduction benefits of CHP even if the legal entity implementing CHP is separate from the entities purchasing the CHP power and heat output. • The allocation for CHP power output shall reflect the marginal capacity of the grid during the time period in

Comment [S1]: This is a strange set of units, John are you sure of the numbers?

		which the facility operates. Procedures for streamlined permitting of CHP facilities. Regulate air emissions and GHG based on useful energy output rather than fuel input. Amend I-937 to include organic pulping byproducts as renewable fuels and thermal energy production as well as electricity.

Waste Heat Recycling -- recovery (recycling) of waste heat from industrial processes or municipal operations.

Straw Policies	Actions	Supporting Specific Steps
Waste Heat from CHP, industrial processes or municipal operations (waste to energy) shall be required.	Use of low-grade waste thermal energy shall be facilitated through development of thermal energy distribution (district energy) systems. Substantial quantities of potentially usable energy are produced as a byproduct of industrial processes and municipal operations. Recovery and reuse of this usable energy will be encouraged. A variety of industries, such as pulp and paper mills, saw mills, steel mills, and aluminum smelters, alternative fuel generation plants, cement plants and other facilities, produce waste heat at temperatures suitable for building heating. Recovery and reuse of this usable energy will be encouraged. Municipal operations produce byproduct energy in the form of landfill gas (which can be combusted	Financial incentives to implement district energy thermal distribution infrastructure, waste heat recovery and renewable thermal energy systems through a variety of programs including: • Property owner incentives to join waste heat based district heating systems; • Low-cost bonding or loan guarantee programs; • Tax credits for *investment* in thermal energy projects, and/or for *production* of recycled energy; • Incentives for buildings to connect to district energy systems established to use or convert to renewable energy or recover waste energy; and

	in CHP engines or turbines) or sewage effluent (which can be converted to usable heat with heat pumps). Recovery and reuse of this usable energy will be encouraged	• Incentives to upgrade existing steam district energy systems to hot water district energy distribution to enhance system performance and improve efficiencies. Design GHG trading so that -- • District energy systems are credited for avoided building boiler emissions in the allowance allocation process. • CHP and District Energy systems are credited for their impact on total emissions by issuing allowances for both the heat and power production. Procedures for streamlined permitting of thermal energy recovery facilities. Regulate air emissions and GHG based on useful energy output rather than fuel input.

Other Measures to Remove Barriers

Pro-active information/education/outreach communications are needed to address the importance of removing barriers to optimizing existing and CHP generation and district energy development. We need to overcome real or perceived barriers about such important issues as avoided cost barriers, regulatory barriers, lack of integrated community energy planning, and lack of financial sector misunderstanding of these systems.

- **Goals:** 2,000 MWs of repowered existing and new CHP by 2020.
- **Timing:** By 2020, another 500 MWs per year through 2050.
- **Coverage of parties:**
- **Other:**

  Renewable Energy -- tapping local renewable resources such as bio-energy and geothermal.

- Bio-energy includes a range of biomass feedstocks and technologies for conversion of these materials into useful energy.
    - "Biomass" is a general term for organic materials, and encompasses woody materials such forest wood wastes, wood chips, urban waste wood (tree trimmings), sawmill residue, crop residues, organic portions of municipal waste. Encourage development of cellulosic ethanol via pro-active policies and incentives.
    - Increasing interest in bio-energy is driven by advances in technology, environmental benefits, energy supply and price stability, and the potential for significant spin-off employment in fuel procurement and processing.
    - For some biomass materials, using the biomass for energy also can eliminate a waste disposal and landfill saturation problem.
    - Biomass can be used directly to produce thermal energy and/or electricity. Liquid or gaseous fuels can be produced from biomass for combustion in reciprocating engines or gas turbines.
- Geothermal resources are found throughout most of the western continental U.S., Alaska, Hawaii, and, to a lesser degree, in areas of the south and east.
    - Power generation is only one aspect of geothermal resource development. Geothermal heating, especially when coupled with district energy systems, can contribute significantly to reduction in the use of conventional fuels.
    - There are 271 communities in 10 western states, including WA, with nearby geothermal resources that could provide a renewable source of heating. These cities represent a population of 7.4 million people.

Implementation Mechanisms

Related Policies/Programs in Place

PURPA, 1978.
B & O Taxes.
Business Energy Tax Credits (BETC) in Oregon.

Type(s) of GHG Reductions

[Insert text here]

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

- **Data Sources:**

State wide IRP used to determine potential for CHP. USDOE Study in 2004 (see Washington State University Energy Program CHP website). Industry to report thermal energy rejection quantities.

- **Quantification Methods:**
- **Key Assumptions:**

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):**
- **Job Creation:**
- **Reduced Fuel Import Expenditures:**

Key Uncertainties

No significant CHP capacity has been built during the past 15 years due to a number of important economic and policy barriers that need to be overcome:

- A fundamental constraint is that the thermal heat recovery savings, environmental (both GHG and renewable fuel) benefits, energy security infrastructure cost savings associated with on-site CHP generation and power grid transmission & distribution benefits of CHP are prepared are inadequate considering in system utility marginal cost economics. [this sentence needs to be reworded, I don't understand what it means] Thus, utility avoided cost presented every two years in are too low and do not encourage existing CHP facilities to generate at most efficient rates nor provide drivers for new project development and implementation. [The avoided cost is the cost of the next best alternative including fuel risk, carbon risk, transmission interconnection costs and losses, capacity and capacity factors, intermittency, generation shape, imputed debt, green tag credits, etc. If a CHP is within a load center, infrastructure cost savings and distribution loss savings can be calculated. Also, there is no law that prevents a CHP generator from selling its power on the wholesale market thus avoiding utility avoided cost rates]. Furthermore, a CHP developer is not bound by the avoided cost calculation for its local (presumably, investor-owned utility); avoided cost calculations vary by investor-owned utilities and a CHP developer could sell to any one of them.]
- Dispatchabilty is raised by utilities as a barrier by many utilities. Total control ot generation is their operating policy. This objection can be largely overcome by negotiating reasonable operation flexibility into power sales agreements that allow for critical dispatchablity at reasonable costs to meet the needs of the grid with those of the local generating CHP generator. [Dispatchability should be negotionable.]
- Grid interconnection standards are complex, time consuming and extremely costs. The WA Utility Commission needs to expedite efforts to streamline with an eye on fast tracking new projects and eliminating over burdensome and costly barriers to grid interconnection. [WA State is currently revising its interconnection procedures. If the generator desires to sell the power on the wholesale market, FERC's proforma Generator Interconnection Agreements must be followed.]

- High transaction costs associated with small CHP projects, high financing costs because of lender unfamiliarity and perceived risk,

- "Split incentives" between building owners and tenants, and utility-related policies like interconnection requirement, high standby rates, exit fees, etc.

Need for a pro-active public information campaign to educate and inform the public of the benefits of CHP to Washington and the NW economy.

Additional Benefits and Costs

[Insert text here]

Feasibility Issues

[Insert text here]

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

ES-8. Advanced Fossil Fuel Generation and Pre-Combustion Sequestration Technologies

Based on ES Catalog Options 3.1a.

Mitigation Option Description

In addition to increased efficiency and renewable energy investment, the development and commercialization of advanced clean coal technology is a critical third component in a portfolio of GHG mitigation actions. The most viable of these technologies today appears to be Integrated Gasification Combined Cycle (IGCC) combined with carbon capture and storage (CCS) technology. An IGCC plant can be installed with a number of different configurations. One configuration involves installation of Level II emission controls with a spare gasifier and space provisions for future installation of carbon capture equipment. Level II emission controls would include a selective catalytic reduction (SCR) system for enhanced NO_x control. A Level II emission control system would achieve emission levels close to those of a natural gas-fired combined cycle plant. Installation of a spare gasifier would enable availability and capacity factors close to a conventional pulverized-coal plant. Another IGCC configuration is for a plant without the spare gasifier. A third configuration might be for an IGCC plant with CCS.

IGCC plants generate electricity by gasifying coal and using clean "syn-gas" to fuel a combustion turbine in a combined cycle configuration. IGCC technologies have improved efficiencies compared to traditional pulverized coal plants. The overall efficiency of an IGCC plant depends on gasifier technology and coal type. Improvements in overall efficiency translate into reductions in CO_2 emissions; for every one percent of efficiency gain, a plant produces about 2 percent less CO_2 per kWh.[16] A generic IGCC plant has a CO_2 emissions rate of 1600-1760 lb/MWh as compared to a rate of 2000 lb/MWh for a traditional coal plant.[17] IGCC plants also have reduced air pollutant emissions, such as sulfur dioxide (SO_2), nitrogen oxide (NO_x) and mercury,[18] compared to pulverized coal-fired plants. Additionally, using currently available commercial separation technologies, the cost of carbon capture from an IGCC plant is expected to be lower than the cost to capture carbon emissions from a traditional pulverized coal plant.

A significant advantage for IGCC when compared to conventional pulverized coal with amine-based carbon capture is the reduced cost of capturing CO_2 from the process. Carbon capture

[16] U.S. Department of Energy Fact Sheet: Clean Coal Technology Ushers in New Era in Energy, located at http://www.state.gov/g/oes/rls/or/2006/77196.

[17] "Exhibit 3-18, Emission Data from the Literature" page 3-29, from the Final Report, "Environmental Footprints and Costs of Coal-Based Integrated Gasification Combined Cycle and Pulverized Coal Technologies", EPA-430/R-06-006, United States Environmental Protection Agency, July 2006, located at http://www.epa.gov/airmarkets/articles/IGCCreport.pdf.

[18] PacifiCorp's 2004 Integrated Resource Plan (IRP) Update estimated IGCC reductions of 73% for SO2, 85% for NOX and 22% for mercury over a supercritical pulverized coal plant. PacifiCorp's 2004 IRP Update at 24, located at http://pacificorp.com/File/File57884.

technologies have the potential to remove approximately 90 percent of a coal plant's CO_2 emissions.[19] Gasification plants have been built and demonstrated around the world, primarily as a means of producing chemicals from coal. Only a limited number of IGCC plants have been constructed specifically for power generation. In the United States, these facilities have been demonstration projects and cost significantly more than conventional coal plants in both capital and operating costs. These projects have been constructed with significant funding from the federal government. A number of IGCC technology suppliers have teamed up with large constructor to form consortia who are now offering to build IGCC plants. A few years ago, these consortia were willing to provide IGCC plants on a lump-sum, turn-key basis. However, in today's market, the willingness of these consortia to design and construct IGCC plants on lump-sum turn key basis is in question. An extensive and costly front-end engineering design (FEED) study is required to obtain reasonably accurate estimates of the cost of building an IGCC plant.

Both environmental and national security concerns support the accelerated development of advanced clean coal technologies. The North American Electricity Reliability Council recently reported that demand for electricity is increasing three times faster than new generating resources can be added.[20] Coal is the nation's most abundant fuel source.[21] Coal now accounts for 50 percent of the electricity generated in the U.S. and, as the lowest cost source of electricity generation, this percentage is expected to increase.[22]

The important role of advanced clean coal technology is recognized in the Western Public Utility Commissions' Joint Action Framework on Climate Change, signed on December 1, 2006 by the Washington, Oregon, California and New Mexico public utility commissions.[23] The Framework's Statement of Shared Principles includes five principles, the second of which is "Development and use of low carbon technologies in the energy sector." The third of six Action Items is: "Explore ways to remove barriers to development of advanced, low-carbon technologies for fossil fuel-powered generation capable of capturing and sequestering carbon dioxide emissions."

There are a number of barriers that stand in the way of large scale commercial development of IGCC and CCS technologies, particularly for investor-owned utilities (IOUs). Over the last several years, many states and the federal government have passed laws to address the most problematic of these. To promote Washington policies on climate change and sustainability, Washington should join these lawmakers in enacting clean coal legislation.

Mitigation Option Design

The following specific policy options have been proposed by members of the work group:

[19] PacifiCorp's 2007 IRP at 98, located at http://www.pacificorp.com/Navigation/Navigation23807.html.

[20] *Mixed Signals Leave Developers Wary of Building New Infrastructure*, 144 Pub Util Fort 4 (Nov 2006).

[21] *Financing Clean Coal*, 143 Pub Util Fort 73 (June 2005).

[22] U.S. Department of Energy Fact Sheet, supra note 3.

[23] Western Public Utility Commissions' Joint Action Framework on Climate Change (December 1, 2006), located at http://www.puc.state.or.us/puc/news/2006/2006026jointaction.

a. The Need for a Comprehensive Legal and Regulatory Framework for Advanced Coal Power Plants coupled with CCS.

IGCC coupled with CCS raises new legal and regulatory risks associated with siting and permitting projects, CO_2 transportation, injection and storage.[24] These risks are not yet fully understood, nor are uniform standards or government regimes in place to address and mitigate them. Among the key questions to be addressed in the development of a consistent regulatory framework for CCS are: immunity from potentially applicable criminal and civil environmental penalties; property rights, including the passage of title to CO_2 (including to the government) during transportation, injection and storage; government-mandated caps on long-term CO_2 liability, insurance coverage for short-term CO2 liability; the licensing of CO_2 transportation and storage operators, intellectual property rights related to CCS, and monitoring of CO_2 storage facilities.

California recently adopted AB 1925, directing the California Energy Commission to recommend standards to accelerate the adoption of long-term management of industrial CO_2.[25] Washington should similarly develop guidelines for addressing the emerging legal and regulatory issues associated with CCS. Among the options it should explore is that adopted by Texas, which transfers the title (and any liability post-capture) to CO_2 captured by CCS to the Railroads Commission of Texas.[26] New Mexico Governor Richardson's Executive Order 2006-69 required the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) to coordinate with a stakeholder group to explore and identify statutory and regulatory requirements needed to geologically sequester anthropogenic CO_2. The group recently published an interim report[27] that identifies the issues and challenges that must be addressed by potential statutory and regulatory changes, to identify questions, concerns and recommendations made by the stakeholder group, and to present preliminary findings and research to date for further policy development. A final report, with findings and recommendations, is due on December 1, 2007. The approach and process undertaken in New Mexico could be easily replicated in Washington.

- **Goals:** Executive Order or legislation directing state agencies to identify regulatory and legal barriers to the commercialization of advanced coal power plants coupled with CCS. The final product could be a report to either the Governor or the legislature.
- **Timing:** 2008 or 2009
- **Coverage of parties:** Primarily focused on state regulatory agencies.
- **Other:**

[24] Robertson, K., Findsen, J., Messner, S., Science Applications International Corporation. June 23, 2006. "International Carbon Capture and Storage Projects Overcoming Legal Barriers", prepared for the National Energy Technology Laboratory (see http://www.netl.doe.gov/energy-analyses/pubs/CCSregulatorypaperFinalReport.pdf)

[25] California AB 1925 (2006), located at http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_1901-1950/ab_1925_bill_20060926_chaptered.

[26] Texas H.B. 149 (2006).

[27] See, http://www.emnrd.state.nm.us/OCD/documents/InterimReportCO2Sequestration.pdf

b. The Traditional Least-Cost/Least Risk Regulatory Standard Should Be Modified to Allow Development of CCS-Equipped IGCC and Pulverized Coal Resources.

IGCC plants have higher capital and operating costs than traditional coal plants. PacifiCorp's 2004 Integrated Resource Plan Update analyzed the costs of an IGCC plant equipped with CCS technology. This analysis demonstrated that a CCS-ready, IGCC plant costs at least 16.9% more than a supercritical pulverized coal plant.[28] Additionally, while reliable estimates for carbon geologic sequestration costs do not yet exist, the Department of Energy's research program goal is $10 per MWh.[29]

IOUs in Washington are subject to a least cost standard for new resources.[30] Additionally, Washington IOUs are required to implement their integrated resource plans through competitive bidding to ensure implementation of this least cost policy.[31] Because the costs of IGCC and CCS technologies are higher than uncontrolled traditional pulverized coal, an IGCC or a CCS investment is difficult to justify under a least cost/least risk standard. For example, in 2003, the Wisconsin Public Service Commission rejected Wisconsin Electric's request for a certificate of need for an IGCC plant on the basis that the plant was not cost-effective.[32]

Washington should eliminate this barrier to IGCC and CCS technologies for IOUs by adopting a "reasonable and necessary" standard for IGCC and CCS technologies used to serve Washington customers, in place of a least cost/least risk standard. Indiana adopted a similar approach, requiring the Indiana Utility Regulatory Commission to encourage the development of IGCC and CCS as long as it concludes that the projects are reasonable and necessary.[33] Note, the projects must still comply with the newly enacted greenhouse gas emissions performance standard, promulgated within Senate Bill 6001 (2007).

- **Goals:** Executive Order or legislation directing the Washington Utilities and Transportation Commission to change the least cost/least risk regulatory standard in order to advance the use of advanced coal power plant technology coupled with CCS.
- **Timing:** 2008 or 2009

[28] PacifiCorp 2004 IRP Update at 24, supra note 5.

[29] *Id*.

[30] *See In re Least Cost Planning for Gas and Electric Companies*, WUTC Docket Nos. UE-030311, UG-030312 (July 25, 2006) (amending WAC 480-100-238, which provides that electric utilities have the obligation to meet their system demand with a least cost mix of resources.)

[31] *See In re Chapter 480-107 WAC*, Docket No. UE-030423 (March 31, 2006) (amending/enacting competitive bidding rules, including WAC 480-107-015 requiring the filing of an RFP after an integrated resource plan).

[32] *In re: Wisconsin Electric Power Company*, 05-CE-130 (Nov 10, 2003).

[33] IC 8-1-8.8-11(a), provides that "The Commission shall encourage clean coal and energy projects by creating the following financial incentives for clean coal and energy projects, if the projects are found to be reasonable and necessary."

- **Coverage of parties:** Washington Utilities and Transportation Commission, investor-owned utilities and interested stakeholders
- **Other:**

c. Washington Should Enact Tax Incentives to Help Bridge the Cost Gap Between IGCC and CCS Technologies and Traditional Uncontrolled Coal.

To bridge the cost gap between IGCC and CCS technologies and traditional coal, EPACT 2005 contained new investment tax credits for advanced coal technologies, including IGCC.[34] EPACT 2005's IGCC tax credits were heavily over-subscribed, however, with applications totaling $5 billion for only $1.6 billion in credits.[35]

Washington should enact state or jointly advocate for federal tax incentives to encourage new IGCC and CCS development to serve Washington customers, adding to those already exhausted under EPACT 2005. The most effective combination of tax incentives for IOU development of IGCC and CCS technologies is a tax credit plus accelerated depreciation. Note, the projects must still comply with the newly enacted greenhouse gas emissions performance standard, promulgated within Senate Bill 6001 (2007).

- **Goals:** State legislation and/or coordination with the Washington Congressional delegation advocating new tax incentives to encourage the commercialization of new advanced coal power plants coupled with CCS..
- **Timing:** 2008 or 2009
- **Coverage of parties:** multiple parties
- **Other:**

d. The Added Risks and Financing Challenges of IGCC and CCS Should Be Mitigated With Assured, Timely Cost-Recovery.

The developmental nature of IGCC and CCS technologies creates added risk and cost during the pre-construction phase, in construction of the plant and in the plant's performance. While engineering and construction designs for a traditional coal plant cost less than $1 million, an IGCC plant cannot be built without a Front End Engineering Design (FEED) study. Such a study costs $10-$20 million and requires 10-14 months for completion.[36] Because commercial-scale IGCC and CCS technologies are new, the risk of cost-overruns, construction delays and delays in achieving anticipated reliability levels are all higher than for a traditional coal plant.

This added risk and cost create financing challenges for an IGCC or CCS investment. Assured, timely cost recovery, typically achieved by "pay as you go" proposals, is necessary for large

[34] EPACT 2005, Title XIII, Subtitle A, Section 1307

[35] U.S. Department of Energy Fact Sheet, supra note 3.

[36] PacifiCorp 2004 IRP Update at 26, supra note 5.

IGCC or CCS projects to obtain financing and move forward. For example, the Ohio Public Utilities Commission recently allowed American Electric Power (AEP) to recover an estimated $23.7 million in first-phase IGCC pre-construction costs through a 12-month generation surcharge.[37] AEP proposed a second-phase of recovery during construction to cover financing costs, and a third-phase to recovery the costs of the plant after it becomes operational. Similarly, the Indiana Utility Regulatory Commission approved the requests of two utilities for deferral and recovery of IGCC pre-construction costs.[38]

Washington should adopt a full and timely cost-recovery standard for IOU investment in IGCC or CCS technologies used to serve Washington customers. RCW 80.04.250, Washington's "used and useful" statute, generally precludes recovery for capital investments, however, unless a plant is operational.[39] To mandate "pay as you go" cost recovery for IGCC or CCS investments, Washington's clean coal legislation would need to create a limited exception to this statute for IGCC and CCS investments. Colorado, Indiana and Pennsylvania all provide full cost-recovery assurances for IGCC and CCS by statute; Colorado additionally includes recovery for replacement power costs associated with unplanned IGCC plant outages.[40]

- **Goals:** Executive Order or legislation directing the Washington Utilities and Transportation Commission to implement changes to Washington's "used and useful" statute, mandating "pay as you go" cost recovery for advanced coal power plants coupled CCS, in order to advance their commercialization.
- **Timing:** 2008 or 2009
- **Coverage of parties:** Washington Utilities and Transportation Commission, investor-owned utilities and interested stakeholders
- **Other:**

e. Credit for Early Action is Critical When Designing CO_2 Cap and Trade Rules.

Avoided GHG emissions attributable to advanced fossil fuel generation and pre-combustion sequestration technologies placed into operation prior to any mandate or that exceed an operating permit limitation should be creditable as early actions within the context of a state or regional mechanism to achieve GHG reductions.

- **Goals:** Executive Order or legislation directing the stating the position of Washington is to ensure credit for early action for advanced coal power plants coupled CCS within any proposed cap and trade rule being developed either by the state of Washington or jointly

[37] *In re Columbus Southern Power Co. and Ohio Power Co*., Case No. 05-376-EL-UNC (Ohio PUC April 10, 2006).

[38] *In re PSI Energy*, Cause 42894 (Indiana URC July 26, 2006).

[39] RCW 80.04.250 requires investments included in rates to be "used and useful for service in [Washington]." The statute contains a limited exception for construction work in progress, allowing recovery in rates upon a finding that recovery is in the public interest.

[40] Colorado House Bill 06-1281; Indiana IC 8-1-8.8; Pennsylvania SB 1030.

developed in partnership with neighboring western states (e.g., Western Climate Initiative), in order to advance their commercialization.

- **Timing:** 2008
- **Coverage of parties:** Primarily the state agencies participating within the Western Climate Initiative, but other interested stakeholders as well.
- **Other:**

f. Energy Workforce Development.

Employment projections for the U.S. energy industry suggest that large numbers of employee retirements will occur over the next decade. Nationally, 50 percent of utility workers are projected to retire over the next 10 years. This represents a loss of some 200,000 experienced workers.[41] These forecasts raise important questions about the industry's capacity to replace a skilled workforce.[42] Preliminary data from Washington and Oregon suggest that employers in the Pacific Northwest are not immune to the looming shortage of energy workers. Employers are already having serious problems finding qualified labor, and demographic shifts will have a negative effect on new employee recruitment. Low enrollments in engineering and technology training programs will lead to even greater competition for new employees.

Existing labor market data and anecdotal information is insufficient to explain the conditions facing the industry in the Pacific Northwest, including future employment and education requirements employers are forecasting due to retirements, industry growth and technology. Little systematic data exists regarding the level of demand for education and training in related groups of occupations, including the specific types of programs most needed, and the types of skill sets employers require. Colleges, employers and other workforce development service providers need this information to effectively plan and design new programs, facilities and services, and to secure public funds for program startups and enhancements. To help fill the data and information gaps, researchers from Washington State University's Energy Program are conducting a labor market and workforce education needs assessment of the energy industry in Washington and Oregon. This work is sponsored by the Centralia College Center for Excellence in Energy Technology, the State Board for Community and Technical Colleges, Pacific Mountain Workforce Development Consortium, Tacoma Power, the IBEW Local 77, and the Thurston-Lewis-Mason Central Labor Council. The research results will assist regional energy employers, colleges, and other stakeholders to anticipate the education and training needs of the industry.

- **Goals:** Executive Order or legislation providing funding to support Washington resource mapping, with a particular emphasis on energy-related workforce skill set development.
- **Timing:** 2008

[41] Electric Power Research Institute, 2006.

[42] See: Ashworth, M. (2006). Preserving knowledge legacies: Workforce aging, turnover, and human resource issues in the U.S. electric power industry. International Journal of Human Resource Management, 17(9): 1658-1687.

- **Coverage of parties:** Academia and state regulatory agencies.
- **Other:**

Implementation Mechanisms

Either an Executive Order or legislation.

Related Policies/Programs in Place

Type(s) of GHG Reductions

Primarily direct greenhouse gas emissions of CO_2, CH_4, and some N_2O.

Estimated GHG Savings (in 2020) and Costs per $MtCO_2e$

Improvements in overall coal power plant efficiency translate into reductions in CO_2 emissions; for every one percent of efficiency gain, a plant produces about 2 percent less CO_2 per kWh.[43] A generic IGCC plant has a CO_2 emissions rate of 1600-1760 lb/MWh as compared to a rate of 2000 lb/MWh for a traditional coal plant.[44] IGCC plants also have reduced air pollutant emissions, such as sulfur dioxide (SO_2), nitrogen oxide (NO_x) and mercury,[45] compared to pulverized coal-fired plants. When coupled with CCS, CO_2 emissions can be expected to be reduced as much as 90%.

- **Data Sources:** EPA and DOE
- **Quantification Methods:** (see federal agency reports)
- **Key Assumptions:** (see federal agency reports)

Contribution to Other Goals

- **Contribution to Long-term GHG Emission Goals (2035/2050):** Advanced coal power plants coupled with CCS when developed as new electricity resources will minimize the addition of greenhouse gases to Washington's inventory.
- **Job Creation:** To be determined. One of the proposed options includes Washington resource mapping, with a particular emphasis on energy-related workforce skill set development.

[43] U.S. Department of Energy Fact Sheet: Clean Coal Technology Ushers in New Era in Energy, located at http://www.state.gov/g/oes/rls/or/2006/77196.

[44] "Exhibit 3-18, Emission Data from the Literature" page 3-29, from the Final Report, "Environmental Footprints and Costs of Coal-Based Integrated Gasification Combined Cycle and Pulverized Coal Technologies", EPA-430/R-06-006, United States Environmental Protection Agency, July 2006, located at http://www.epa.gov/airmarkets/articles/IGCCreport.pdf.

[45] PacifiCorp's 2004 Integrated Resource Plan (IRP) Update estimated IGCC reductions of 73% for SO2, 85% for NOX and 22% for mercury over a supercritical pulverized coal plant. PacifiCorp's 2004 IRP Update at 24, located at http://pacificorp.com/File/File57884.

- **Reduced Fuel Import Expenditures:** Improvements in overall coal power plant efficiency translate into reductions in CO_2 emissions; for every one percent of efficiency gain, a plant produces about 2 percent less CO_2 per kWh.[46]

Key Uncertainties

The key uncertainty is technology development and deployment risks.

Additional Benefits and Costs

Additional benefits include electricity generation fuel diversification, which should assist with hedging both natural gas and electricity price risks, production intermittency concerns associated with wind resources, and possible lower availability of existing hydroelectric resources.

Feasibility Issues

High feasibility for agency-related options (e.g., already underway in other state jurisdictions, focus is in areas which are the traditional legal or regulatory domain of the state).

[*CCS Note: Following moved from "Barriers to Consensus" category, which is reserved for reporting on results of CAT deliberations*]

Need to develop comparable incentives for publicly-owned utilities.

Status of Group Approval

TBD [*Reserved for reporting on approval by CAT*]

Level of Group Support

TBD [*Reserved for reporting on support by CAT*]

Barriers to Consensus

TBD

[46] U.S. Department of Energy Fact Sheet: Clean Coal Technology Ushers in New Era in Energy, located at http://www.state.gov/g/oes/rls/or/2006/77196.